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Author(s)	Aung, Cho Hla
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Emergence success of natural nests for olive ridley on sandy beach, Kadongalay Island in Myanmar

CHO HLA AUNG

Sea Turtle Conservation Unit, Department of Fisheries,
Ministry of Livestock and Fisheries, Yangon, Myanmar.

ABSTRACT

The Kadongalay Island (15°49'N, 95°13'E) has existed since 1911. This Island is formed with deposited sand at the mouth of Bogalay River, Ayeyarwady delta in Bay of Bengal and it's close to Andaman Sea, Kadongalay Island is 5-miles length and three quarters mile in breadth, turtles laying the eggs on this island from September to March yearly. Department of Fisheries was undertaking sea turtle conservation and research started on Kadongalay Island in 1998. In Kadongalay Island, only olive ridley (*Lepidochelys olivacea*) attended to this Island for nesting. About 120 nests could be found each year along the sand beach. All nests have been preserved naturally. Nesting female turtles lay the eggs on the sand bank with white siliceous sand, three different kinds of places as lower slope, upper slope and dune. Data were recorded including nest location and date, and then watched until the time of hatching out. After the hatchlings were hatched out from clutches, the egg hatching rate and other parameters were examined immediately. Data for these clutches such as temperature, incubation period, emergence success and clutch sizes from three different areas were collected. The results showed that average temperature was 29.3°C, 51 days of incubation period and 96.17% of emergence success in dune. Average temperature was 28.53°C, 50 days of incubation period and 89.8 % of emergence success in upper slope. Average temperature was 27.4°C, 49 days of incubation period and 95% of emergence success lower slope. Digital thermometers and measuring tapes were used for these researches. All clutch sizes were not different from each other. Nesting turtles did not make deeply the body pits in the above mentioned sand.

KEYWORDS: Kadongalay Island, natural nests on pure sand bank, white siliceous sand, olive ridley (*Lepidochelys olivacea*), temperature, incubation period, emergence success, sand temperature of clutches, digital thermometers and measuring tapes

INTRODUCTION

Myanmar coastline lies from north to south and has length of about 2831.84 Km embracing many Islands and sand banks. Sea turtles build their nests and lay their eggs on those Islands and sand banks Figure 1.

Nests of sea turtle are observed around the Andaman Sea in Mon State and Tanintharyi Division, the Gulf of Mattaban (Gulf of Mottama) in Ayeyarwady Division and the Bay of Bengal in Rakhine State. In Ayeyarwady delta, the beach of Thameehla Island (Diamond Island) 15°51' N, 94°17'E, an Island at the mouth of Patheingyi River, hosts the most nesting green and some olive ridley turtles, but Kadongalay Island 15°49'N, 95°13'E, an Island at the mouth of Bogalay River, respectively hosts the only nesting olive ridleys. At the time of Maxwell's report (1911), the Kadongalay Island was in existence. This Island formed with deposited sand at the mouth of Bogalay River in Ayeyarwady delta. Kadongalay Island is 5 miles length and three quarters mile in breadth,

turtles lay their eggs on this Island from September to March yearly, Department of Fisheries was undertaking for sea turtles conservation and research started on Kadongalay Island since 1998. Only olive ridley (*Lepidochelys olivacea*) has been found on Kadongalay Island when attended to this Island for nesting. About 120 nests could be found each year, along the sand beach in seasonal. All nests have been preserved naturally.

MATERIALS AND METHODS

Female turtles made their nests to lay the eggs, on the sand bank of Kadongalay island Figure 2.

The sand bank consists of a white siliceous sandy beach. Rookery area is 5 miles in length from east to north-west aspect cross bow shape and faced to the sea. There are three different kinds of places in the experiment lower slope, upper slope and dune on nesting area. Each nest was fixed pillars for date of laying eggs and serial

number to recognize. At the same time they were recorded in data note book. Many data and causes included in this book for preservative nests. The data were recorded, such as egg laying date and time, nest pillar number, sector number for location of rookery approximate incubation period, number of death hatchlings, number of unhatched eggs, number of undeveloped eggs, number of total eggs; then other events and causes were recorded at tagging and tag recovering and nest examination forms. Eleven clutches were used respectively to submit this paper, from different kinds of places on the sandy beach such as lower slope, upper slope and dune. Above high tide

level of the beach is known to be lower slope, dune is highest than the slopes of beach and small sand hills, upper slope lies between lower slope and dune. The clutches of nest pillar selected as number 32, 36, 42, 45 and 47 on the part of lower slope; nest pillar number 1, 3 and 4 on the part of upper slope and number 14, 23 and 31 on the part of dune, there were situated along the beach respectively.

When the mentioned clutches hatched they were examined immediately, that of hatched eggs shells, unhatched and undeveloped eggs were counted. The nest temperature was recorded by digital thermometer. Neck and total depth of clutches were measured by flexible tape. The clutches of nest pillars from lower slope, upper slope and dune were recorded for each clutches (Table 2).

The nest pillars from lower slope, number 32, 36, 42, 45 and 47, each nest temperature recorded as 27.6°C, 27.2°C, 24.4°C, 27.3°C and 27.8°C respectively. Above mentioned clutches that of total number of eggs 125, 121, 124, 120, and 128; hatchlings 123, 118, 116, 113 and 117; death hatchlings recorded 2, 1, 2, 3 and 4; Unhatched eggs listed as Nil, 2, 6, 4 and 7; incubation period 53, 50, 50, 46 and 46 days respectively.

As for the nest pillars from upper slope, number 1, 3, and 4; each nest temperature recorded as 28.3°C, 28.4°C, 28.9°C; total number of eggs such as 82, 121 and 113; hatchlings 78, 118 and 87; death hatchlings 1, Nil and 2; unhatched eggs 3, 3 and 4; incubation period 50, 52 and 50 days respectively.

Nest pillars from dune areas, number 14, 23 and 31 each nest temperature recorded as 29.1°C, 29.3°C, 29.5°C and 29.5°C; as for total eggs were 134, 136 and 100; hatchlings 128, 136 and 93; death hatchlings 1, Nil and 2; unhatched eggs 5, Nil and 5; incubation period 51, 52 and 50 days respectively.

RESULTS

The depth of each clutch was measured at the same time during the clutch inspection, the neck of each clutch and total depth of clutches were measured and recorded. The depth of clutches collected from different locations but did not different to each other, according to their locations. The results of average total depths from different locations are already shown in Table 1.

Correlation between incubation period hatching success and temperature comparative data are shown in Figure 3.

Due to the data collected from different location of Kadongalay Island beach mentioned above, the presentation of the results, average condition of 11 sample nests are as follows;

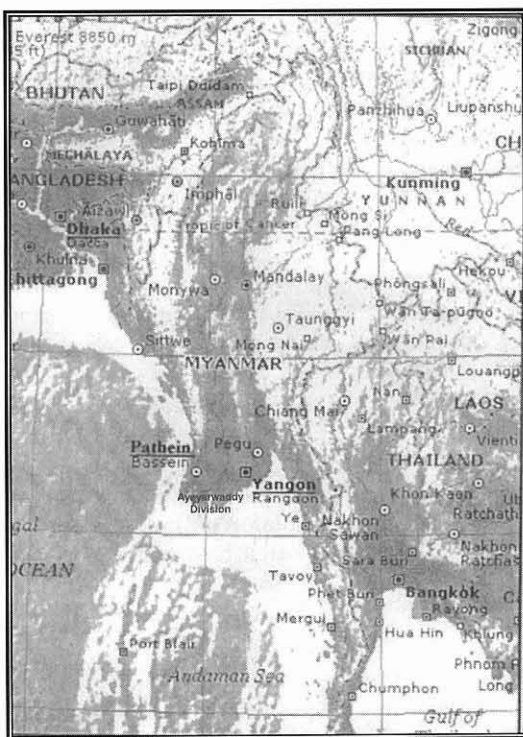


Fig. 1. Map of Myanmar.

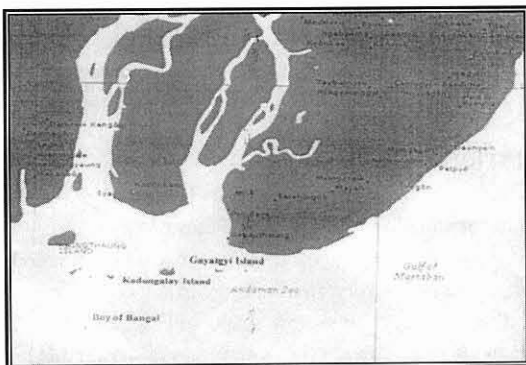


Fig.2. Situation of Kadongalay Island in Ayeyarwady Division

- (1) Average temperature of 11 clutches from three to location of beach

Lower slope	- 27.4 °C
Upper slope	- 28.5 °C
Dune	- 29.3 °C
- (2) Average hatching period

Lower slope	- 49	days
Upper slope	- 50.6	days
Dune	- 51	days
- (3) Average percentage of hatching

Lower slope	- 95	%
Upper slope	- 89.87	%
Dune	- 96.17%	
- (4) Average undeveloped eggs

Lower slope	- 4	Nos
Upper slope	- 10	Nos
Dune	- 3	Nos
- (5) Average death hatchlings

Lower slope	- 2	Nos
Upper slope	- 1	Nos
Dune	- 3	Nos
- (6) Average total death of clutches

Lower slope	- 13	inches
Upper slope	- 15	inches
Dune	- 18	inches

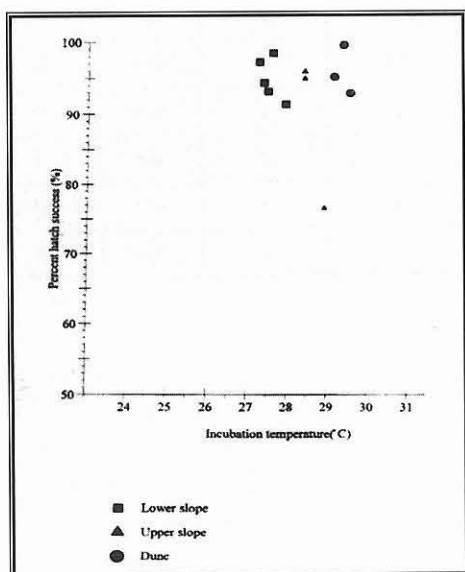


Fig.3. Variation in hatching success of olive ridley turtle eggs relative to incubation temperature in sandy beach of natural nests for three different locations.

DISCUSSION

Due to the above mentioned materials and methods applied we have come across the discussion on the following subjects.

(1) Comparing average total depth of clutches

While examining the clutch depth of 11 sample nests from three different locations on the beach. We found slight differences in average total depth at different location.

Naturally, female turtles attend to move on beach for laying their eggs, that the instinct of female turtles to choose the right place of suitable moistures sand on beach for laying eggs. The average total depth of clutches from different locations can be calculated 15.3 inches which is shown in Table 2.

(2) Comparison in average temperature of clutches

The average temperature of clutches in lower slope is 27.5°C (n = 5, SD =0.24), as in upper slope is 28.5°C (n=3, SD=0.32), and for dune area location the average temperature is 29.3°C (n=3, SD=0.20). The average temperature in different zones are between 27.4°C and 29.3°C which is the most suitable in hatching success. Since also the average temperature ranges from 27°C and 29°C, the sex ratio of the hatchlings on Kadongalay Island beach in nature is equal to (Limpus *et al.*, 1983).

(3) Comparative percentage of hatching rate

Comparative percentage of hatching rate from three different locations results 95% in lower slope 89.87% in upper slope and 96.17% in dune respectively. At Kadongalay Island beach, the average percentage of the clutches hatching rate of 93.68% and seem to be excellent condition in Table 2 and Figure 3. Thus, from the result findings, it can be concluded the average hatching percentage on Kadongalay Island beach consists of siliceous sand is better than that on Thameehla Island beach consists of calcareous sand. Thameehla Island situated at the mouth of Patheingyi River, where the incubation was dune artificially and the average hatching percentage amounts 70% to 80% reportedly. During incubation period, with average temperature 28.6°C ± 0.5°C. Comparative results of the average hatching percentage is siliceous sand is 90.94 % and 78.55% as in calcareous sand (Gordon *et al.*, 1985)

Olive ridley (*Lepidochelys olivacea*) the only species appears to attend on Kadongalay Island with siliceous sand beach for nesting, and hatched naturally, scrutinizing sea turtles. Olive ridley's eggs hatching on siliceous sand in nature such as; (1) Received satisfactory high percentage in hatching. (2) Average hatched temperature equalized to the sex ratio.

Therefore natural nest hatching of sea turtles on siliceous sand, it can be clearly summarize to be the most suitable condition for sea turtle conservation .

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Table 1. Average Measurement of the clutches from different location of Kadongalay Island beach

Nest location	Neck of clutch (inches)	Depth of clutch (inches)	Width of egg chamber (inches)	Remark
Dune	10.5	18	8.5	Average of 3 sample nests
Upper slope	8	15	9	Average of 3 sample nests
Lower slope	6	13	8	Average of 5 sample nests

Table 2. Hatching data collected from different locations of Kadongalay Island beach

Nest pillars No:	Date Laid	Location	Temp: °C	Total No: of eggs	Hatchling No:	Undeveloped eggs No:	Death hatchling No:	Hatched success (%)	Incubation period (days)
1	31.12.02	Upper slope	28.3	82	78	3	1	95.1	50
3	3.1.03	Upper slope	28.4	121	118	3	Nil	97.5	52
4	3.1.03	Upper slope	28.9	113	87	24	2	77.0	50
14	1.2.03	Dune	29.1	134	128	5	1	95.5	51
23	16.2.03	Dune	29.3	136	136	Nil	Nil	100	52
31	25.2.03	Dune	29.5	100	93	5	2	93.0	50
32	25.2.03	Lower slope	27.6	125	123	Nil	2	98.4	53
36	28.2.03	Lower slope	27.2	121	118	2	1	97.5	50
42	5.3.03	Lower slope	27.4	124	116	6	2	93.5	50
45	13.3.03	Lower slope	27.3	120	113	4	3	94.2	46
47	14.3.03	Lower slope	27.8	128	117	7	4	91.4	46

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